



University of Hawai'i at Mānoa

Institute for Astronomy
2680 Woodlawn Drive • Honolulu, Hawai'i 96822

25 November 1997

Dr. Jay Bergstralh
Code SR
NASA Headquarters
300 E Street, SW
Washington, DC 20546

SUBJECT: Progress Report, Grant NAG 5-4249

Dear Dr. Bergstralh,

Enclosed is the annual progress report for the above referenced grant entitled, "Kuiper Belt Objects Along the Pluto-Express Path," under the direction of Dr. David C. Jewitt, Principal Investigator. This report covers the period 1 February 97 - 31 January 98, which is the second year of a three year award.

We herewith request that the additional recommended third year funding be obligated and released to the University of Hawaii. Attached is a budget for the third year.

If you have any questions, please contact Chris Kaukali, Administrative Officer, at 808-956-7562 or email, kaukali@uhifa.ifa.hawaii.edu.

Please ensure that all correspondence to this request is directed to Mr. Marvin S. Enokawa, Director, Office of Research Services, 2530 Dole Street, Sakamaki Hall D-200, Honolulu, Hawaii, 96822.

Sincerely,

Gareth Wynn-Williams for
David C. Jewitt
Principal Investigator

ENDORSEMENT:

Marvin S. Enokawa
Director
Office of Research Services

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xc: Theresa Curtis, 216.0
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David Jewitt, IfA

Progress Report: **KUIPER BELT OBJECTS ALONG THE
PLUTO-EXPRESS PATH**

Principal Investigator: David Jewitt
 Institute for Astronomy, University of Hawaii
 2680 Woodlawn Drive
 Honolulu, HI 96822

Grant: NAG5-4249 (formerly NAGW-4918 from HQ)

Year 2: 2/1/97 - 1/31/98

NASA Tech Officer: Jay Bergstralh

Goals

The science objective of this work is to identify objects in the Kuiper Belt which will, in the 5 years following Pluto encounter, be close to the flight path of NASA's Pluto Express. Our hope is that we will find a Kuiper Belt object or objects close enough that a spacecraft flyby will be possible. If we find a suitable object, the science yield of Pluto Express will be substantially enhanced. The density of objects in the Kuiper Belt is such that we are reasonably likely to find an object close enough to the flight path that on-board gas thrusters can effect a close encounter.

Progress and Accomplishments

Our work to-date has been based on the University of Hawaii 8192 x 8192 pixel charge coupled device mosaic camera. We (PI and graduate student Chadwick Trujillo) have developed a scheme by which to operate this camera in survey mode while analysing the prodigious data stream in near real-time. The camera and the method have been used at the University of Hawaii 2.2 m telescope on 4 occasions so far, resulting in the detection of 17 new Kuiper Belt Objects. Unfortunately, none of the 17 have been shown to possess orbits that will bring them close enough to the Pluto-Express post-encounter trajectory. The first phase of this work has been written up for publication (see Fig. 1, also Trujillo and Jewitt 1997). In the second year of this grant, we have started to prepare for an even larger and

more efficient survey camera. The 12k x 8k CCD camera under construction at the Institute for Astronomy will be used at the prime focus of the 3.6-m diameter CFHT, starting in March 1998. It will bring a factor of 4 to 6 improvement in survey efficiency when compared to the

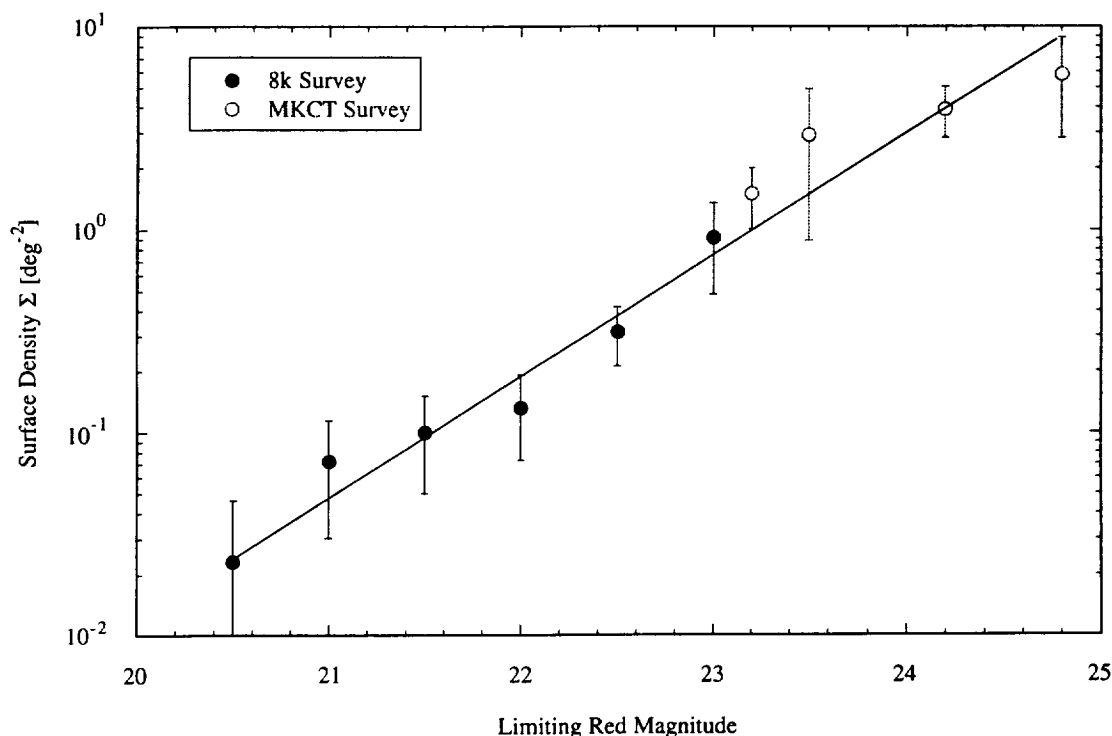


Figure 1: Surface density in the Kuiper Belt determined with the 8k CCD. The surface density is the basic parameter used to assess the likelihood of a close encounter with the Pluto Express spacecraft.

use of the 8k CCD on the 2.2-m telescope. This improvement comes at the price of an increased data-rate. We are currently developing the software and observing strategy needed to handle 30 to 50 Gbyte per night. Observing time on the CFHT has been secured in order to use this new, improved camera in the search for Express candidates.

Anticipated Results

A search with the CFHT and 12x8k camera is planned for May 1998. We anticipate being

able to survey 100 sq. degrees around the Pluto Express path to magnitude 23.5. We expect that either we will locate suitable rendezvous candidates, or we will show that such objects do not exist, at least at size scales ~ 100 km. The Kuiper Belt objects we accumulate as by-products of the search will add to our growing knowledge of the trans-Neptunian population.

Relevant Publications

Trujillo, C., and Jewitt, D. (1997). *Astronomical Journal*, in press.